

Claims

1. A process for the manufacture of acrylylcholine, methacrylylcholine, 2-(N,N-dimethylamino)ethyl acrylate (DMAEA) and/or 2-(N,N-dimethylamino)ethyl methacrylate (DMAEMA), said process comprising reacting choline and/or 2-(N,N-dimethylamino)ethanol with acrylyl-CoA and/or methacrylyl-CoA in the presence of a biocatalyst with choline acetyltransferase activity.
2. The process according to claim 1 which is conducted *in vitro*.
3. The process according to claim 1 which is conducted *in vivo*.
4. The process according to claim 1 which is led partially *in vivo* and partially *in vitro*.
5. The process according to claim 1 where the biocatalyst is within an organism, especially a (more preferably at least during part of its life cycle unicellular) microorganism.
6. The process according to claim 5 wherein the organism is intact.
7. The process according to claim 5 wherein the organism is disrupted.
8. The process especially according to claim 1, 2, 4 or 7 where the biocatalyst with choline acetyl transferase activity is present in at least partially purified form.
9. The process according to any one of claims 1 to 8 where the acrylyl CoA and/or methacrylyl CoA is obtained by reacting coenzyme A with acrylate and/or methacrylate in the presence of an energy providing

substance, especially ATP, and a biocatalyst with S-acetyl CoA synthetase activity.

- 5 10. The process according to claim 9 wherein the reaction catalysed by the biocatalyst with choline acetyltransferase activity and the reaction catalysed by the biocatalyst with S-acetyl CoA synthetase activity take place in one pot, preferably during an at least partially overlapping time period, most preferably during the same time period.
- 10 11. The one pot process according to claim 10 where the reaction catalysed by the biocatalyst with S-acetyl CoA synthetase activity takes place first and the products obtainable are converted subsequently into acrylyl- and/or methacrylylcholine using the biocatalyst with choline acetyltransferase activity.
- 15 12. The process according to any one of claims 1 to 11 where the biocatalysts are enzymes, especially polypeptides having the respective activity.
- 20 13. The process according to any one of claims 1 to 12 wherein the (meth)acrylyl CoA precursor is produced metabolically, especially from one or more precursors derived from biomass.
- 25 14. The process according to any one of claims 1 to 13 wherein methacrylyl CoA and/or (preferably) acrylyl CoA are produced metabolically and the conversion with a biocatalyst with choline acetyl transferase activity in the presence of choline and/or DMAE and/or DMAE in salt form, or in each case starting materials for the biosynthesis thereof derived from biomass, to the products is
- 30 conducted by means of, preferably in, a genetically modified organism (GMO) that is, as far as necessary or desired, modified to comprise the required biocatalytic activities and, if required, transporters.

- 5 15.A genetically modified organism (GMO) transformed with one or more nucleic acids comprising one or more sections coding for and allowing the expression of a biocatalyst with choline acetyltransferase activity.
- 10 16.The GMO according to claim 15 which is an insect, an insect tissue or an insect cell; a plant or a plant tissue; or preferably a (at least during parts of its life cycle unicellular) microorganism, especially a prokaryotic or a fungal microorganism, most preferably a bacterium or a yeast, wherein the nucleic acid comprising one or more sections coding for a biocatalyst with choline acetyltransferase activity is a recombinant nucleic acid.
- 15 17.The GMO according to any one of claims 15 or 16 further comprising a (preferably recombinant) nucleic acid comprising one or more sections coding for one or more transporters appropriate for the transport of one or more starting materials for biocatalytic DMAE(M)A (including the free form and/or salts thereof) and/or preferably (meth)acrylylcholine synthesis into and/or DMAE(M)A and/or 20 preferably (meth)acrylylcholine out of said microorganism.
- 25 18.The GMO according to claim 17 wherein the transporter for transport of choline as a starting material for (meth)acrylylcholine is a choline transporter.
- 30 19.The GMO according to any one of claims 15 to 18 wherein further to one or more nucleic acids comprising one or more sections coding for a biocatalyst with choline acetyltransferase activity one or more nucleic acids comprising one or more sections coding for and allowing for the expression of S-acetyl CoA synthetase are present.

20. The use of a GMO according to any one of claims 15 to 19 for the manufacture of DMAEA, DMAEMA, acrylylcholine and/or methacrylylcholine, comprising administering one or more appropriate starting materials derived from biomass to a culture of said microorganism and isolating the resulting product(s).

21. The *in vitro* and/or *in vivo* use of a biocatalyst with choline acetyltransferase activity to carry out the transfer of a methacrylyl and/or an acrylyl moiety from methacrylyl and/or acrylyl CoA to 2-(N,N-dimethylamino)ethanol, or a salt thereof, and/or choline.